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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/519,659	12/19/2005	Jochen Von Hagen	10808/202	9257

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EXAMINER	
ZHU, JOHN X	

ART UNIT	PAPER NUMBER
2858	

DATE MAILED: 05/02/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/519,659	VON HAGEN, JOCHEN	
	Examiner	Art Unit	
	John Zhu	2858	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 December 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *12/19/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Receipt is also acknowledged of the English Translation of International Preliminary Examination Report from corresponding PCT application number PCT/DE03/02112 with cited documents of Tao et al. (NPL), Jones et al. (NPL), and Ohmi (5,291,142).

Drawings

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, "the AC current independent of the DC current" of claims 1 and 8, and the AC source and DC source being integrated in a pulse generator of claim 6 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an

application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

The following guidelines illustrate the preferred layout for the specification of a utility application. These guidelines are suggested for the applicant's use.

Arrangement of the Specification

As provided in 37 CFR 1.77(b), the specification of a utility application should include the following sections in order. Each of the lettered items should appear in upper case, without underlining or bold type, as a section heading. If no text follows the section heading, the phrase "Not Applicable" should follow the section heading:

(a) TITLE OF THE INVENTION.
(b) CROSS-REFERENCE TO RELATED APPLICATIONS.
(c) STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT.
(d) THE NAMES OF THE PARTIES TO A JOINT RESEARCH AGREEMENT
(e) INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A COMPACT DISC (See 37 CFR 1.52(e)(5) and MPEP 608.05. Computer program listings (37 CFR 1.96(c)), "Sequence Listings" (37 CFR 1.821(c)), and tables having more than 50 pages of text are permitted to be submitted on compact discs.) or
REFERENCE TO A "MICROFICHE APPENDIX" (See MPEP § 608.05(a). "Microfiche Appendices" were accepted by the Office until March 1, 2001.)
(f) BACKGROUND OF THE INVENTION.
(1) Field of the Invention.
(2) Description of Related Art including information disclosed under 37 CFR 1.97 and 1.98.
(g) BRIEF SUMMARY OF THE INVENTION.
(h) BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S).
(i) DETAILED DESCRIPTION OF THE INVENTION.
(j) CLAIM OR CLAIMS (commencing on a separate sheet).
(k) ABSTRACT OF THE DISCLOSURE (commencing on a separate sheet).

(l) SEQUENCE LISTING (See MPEP § 2424 and 37 CFR 1.821-1.825. A "Sequence Listing" is required on paper if the application discloses a nucleotide or amino acid sequence as defined in 37 CFR 1.821(a) and if the required "Sequence Listing" is not submitted as an electronic document on compact disc).

Claim Objections

3. Claims 1 and 8 are objected to because of the following informalities: the written disclosure does not explicitly support the claimed limitation of AC current independently imposed on the test structure than the DC current. Instead, applicant discusses superposing an AC current on the DC current (Page 10, lines 20-25). In light of the specification and for the purpose of examination, the examiner has interpreted the "independent imposed" limitation to be similar to... *expose the conductive structure to an AC current, superposed on a DC current and heats the structure...* Appropriate correction is required.

4. Claim 6 is objected to because of the following informalities: the written disclosure does not explicitly support the claimed limitation of the AC source and DC source being integrated in a pulse generator. Instead, it is disclosed that a DC source 101 is connected to a pulse generator 102, to allow the pulse generator to superpose an AC current on the DC current (Page 10, lines 7-25). In light of the specification and for the purpose of examination, the examiner has interpreted the "integrated" limitation to be similar to ... *integrating a DC source to a pulse generator to provide an AC current superposed on a DC current* ... Appropriate correction is required.

Claim Rejections - 35 USC § 101

5. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 8-12 are rejected under 35 U.S.C. 101 because the claimed invention lacks patentable utility. It is noted that a tangible result is not realized in the method claims. Calculating and determining the resistance values in and of themselves are not tangible results. A step is needed to convey the results, i.e. outputting, displaying, storing, etc.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1-5 and 8-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohmi (5,291,142).

With respect to claims 1 and 8, Ohmi discloses an electromigration test apparatus and method comprising a DC source (First current supply means, column 3, lines 30-31), an AC voltage source (Second current supply means, column 3, lines 44-

45), a circuit electrically coupled to the DC source and AC source (Column 2, lines 10-19) receiving DC and AC signals, a measuring device detecting an electrical parameter which is indicative of the electromigration in the structure to be tested (Column 3, lines 37-43), the direct-current source being set up to expose the structure to conditions which accelerate electromigration (Column 4, lines 42-46), and AC voltage is set up that it exposes the conductive structure to an AC current, superposed on a DC current that thus heats up the structure to be tested (Column 2, lines 15-20/Column 3, lines 50-54).

Although Ohmi does not explicitly disclose the second current supply means as being a voltage source. It is well known in the art that many AC currents are applied from AC voltage sources. Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to specify the second current supply means as a AC voltage source for the purpose of supplying a current larger than the first electric current to heat the interconnect pattern under test (Column 2, lines 15-19).

With respect to claims 2 and 9, Ohmi further discloses the electrical parameter being measured as the resistance of the pattern under test (Column 3, lines 37-43).

With respect to claims 3 and 4, Ohmi further discloses the evaluation unit having a voltage measuring device (Fig. 3, voltmeter 17), a current measuring device (Ammeter 15) and a control device (Computer 18). Although Ohmi does not explicitly disclose the voltage and current measuring device implemented in such a way that a root-mean-square current through the conductive structure and a root-mean-square-voltage across

the conductive structure to be tested can be detected, or the control device control device controls the AC voltage source in such a way to keep the structure temperature constant, applicant is reminded that while features of an apparatus may be recited either structurally or functionally, claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function alone. In the instant case, it is believed Ohmi recites the above structural limitations of the application.

With respect to claims 5 and 12, Ohmi further discloses the conductive structure to be tested is arranged on a semiconductor wafer (Column 3, lines 3-29).

With respect to claim 10, Ohmi discloses all aspects of the claim except for explicitly disclosing measuring the RMS current and voltage value and determine a power value therefrom. However, it implicitly follows that the resistance determining means of Ohmi would use measured current and voltage values to determine resistance, especially RMS values in the presence of AC voltages and currents. Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the measured values of voltage and current as taught by Ohmi to determine the total amount power applied to the structure under test until structure/device failure.

With respect to claim 11, Ohmi further discloses regulating the temperature of the structure to be tested being regulated to a constant value (Column 1, line 44) by means of an evaluation unit (Fig. 1, temperature controller 11).

8. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ohmi as applied to claim 1 above, and further in view of Suzuki et al. (6,223,686 B1).

With respect to claim 6, Ohmi discloses all aspects of the claim except for integrating a DC source to a pulse generator to provide an AC current superposed on a DC current.

Suzuki discloses a DC source (Fig. 1, DC source 17) integrated with a pulse generator (Pulse generator 18) to provide an AC current superposed on a DC current (Column 2, lines 35-37).

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the integration of the DC source and pulse generator as taught by Suzuki into the system of Ohmi for the purpose of applying a superposed current to a substrate under test.

9. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ohmi as applied to claim 1 above, and further in view of Schwarz et al. (4,483,629).

With respect to claim 7, Ohmi discloses all aspects of the claim except for a heating furnace for heating the conductive structure to be tested.

Schwarz discloses a furnace (Fig. 1, furnace 10) used to heat the device under test.

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the furnace as taught by Schwarz into the system of Ohmi for the purpose of providing a temperature ramp which dynamically exposes a conductor operating under currents tree to a linear rise in temperature (Abstract, lines 4-7).

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Snyder et al. (5,625,288) discloses an on-chip high frequency failure test that relies on controlled AC and DC signals and temperature. Ootsuji (6,614,251 B2) discloses an electromigration evaluation circuit that measures the resistance of device under test to determine electromigration damage.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John Zhu whose telephone number is (571) 272-5920. The examiner can normally be reached on M-F, 8-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diane Lee can be reached on (571) 272-2399. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

John Zhu
Examiner
Art Unit 2858

JZ

DIANE LEE
SUPERVISORY PATENT EXAMINER